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VOL. XIV, No. 4 JULY-AUGUST, 1953

BORDEN'S REVIEW

of

NUTRITION RESEARCH

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Reviews and summaries of research information concerning nutrition and foods. Published bi-monthly by THE BORDEN COMPANY; officers of the Company: Theodore G. Montague, president; E. L. Noetzel, treasurer; D. T. Orton, secretary. Editorial office: 350 Madison Avenue, New York 17, N. Y.

NUTRITION RESEARCH AND THE PUBLIC HEALTH PROGRAM

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Introduction

This review attempts to relate the changing role of nutrition in public health programs with the nutritional research of the time. Only brief reference is made to the considerable period prior to about 1926. These last 25 years or so are considered to represent five phases: The Hungry Thirties, The Vitamin Phase, The War Period, Nutrition Surveys, Current Trends. Chief attention is given to research in public health nutrition programs, but reference must also be made to the nutritional research that has taken place outside of such programs since it is much more extensive and has influenced the programs. Only a few references, from many thousands deserving attention, have been cited. For a more extensive, though rather different treatment of the application of nutritional science, reference might be made to various books such as that of Sherman's (49).

Definitions

Since these terms must be frequently used, an attempt is made here to indicate some aspects of public health, public health nutrition, and nutrition research.

Public health programs began to achieve notable successes about 50 years ago in applying knowledge derived from exciting scientific discoveries in bacteriology and immunology. This early history of public health has established a concept which is even now not greatly changed: that public health is concerned with the health of the aggregate or group, with things that affect large numbers, or that are amenable to solution by group action, or that a citizen alone could not institute (31). Thus activities like the prevention and control of communicable diseases, the provision of safe water supplies and of sewer systems, and milk sanitation, are still the basis of public health. While many areas, especially cities, have gone far beyond this point, many other areas have not reached basic levels of public health, even in Canada and the United States. With the gradual development of more interest in general welfare, employment, education and medical care,

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it was inevitable that an important environmental factor like nutrition should find a place in public health programs. This process was hastened by the spectacular aspects of nutrition research, especially on vitamins, and by World War II.

The place of nutrition in public health is still not as clearly defined as we should like. It will be useful to outline the nature of such programs at the present time, so as to understand better the influence of research in reaching this point. Numerous outlines have been made of public health nutrition programs at international (36) and national (20, 11), and state (52) levels. In the only book whose title links nutrition and public health, Gillet (17) says:

"A complete nutrition program must reach the young and the aged, those seemingly in good health as well as those who are known to be below par physically. Many avenues of approach must be used, including homes, schools, health centers, industrial plants and newspapers. A nutrition program can be successful only when everyone has the wherewithal to buy adequate food for good growth and good nutrition.

"Because it is a basic element in so many phases of health work and must reach such large numbers of individuals it requires the cooperation of all groups in the community whose work is of a nature that lends itself to nutrition teaching."

Embracing as the above statement is, more details are needed to get the idea of how nutrition is or may be applied in public health programs. The following outline includes most, if not all broad aspects of programs at present.

Public Health Nutrition Programs Include

1. Informational efforts

(a) Consultant services to professional persons in the health department and any other agency concerned, especially in maternal and child health, dental health, health information, industrial health, sanitation and tuberculosis control.

(b) Preparation, selection and distribution of informational materials on nutrition, and exhibits, demonstrations, etc.

(c) Conferences, institutes, workshops, refresher courses, demonstrations for and with other health and nutrition workers, as well as agriculturists, food technologists, caterers, teachers, social workers, housewives.

(d) Answering queries and requests from groups and individuals.

(e) Assisting school health and nutrition programs.

(f) Home visiting with nurses, etc.

2. Assistance with collective feeding and food distribution, including everything from plans for menus, kitchens, equipment to actual participation.

(a) Institutional feeding.

(b) Communal restaurants.

(c) Industrial canteens.

(d) School-meal.

(e) Distribution of foods such as vitamin D to special groups, e.g. expectant mothers.

(f) Emergency feeding (civil defense).

3. Improvement of the quality of foods and their distribution.

(a) Production of more nutritious foods, including home efforts.

(b) Conservation of nutritional values.

(c) Nutritional improvements of foods by adding other foods, or synthetic vitamins, etc.

4. Research and investigation into the state of nutrition, or into food habits, or into educational methods, or into the effects of a particular diet. The trend at present is to rather less wide-spread nutrition surveys and more of an emphasis on detailed study of the causes and cures of specific problems, such as anemia or resistances to foods.

Research may be taken in a broad sense to include any systematic investigation of the interrelationships leading to particular results. Such a definition permits consideration of social and educational, as well as laboratory and field studies that might lead to human betterment (which is the objective of public health) through nutrition (which is one phase of man's environment).

Prior to 1926

In the "Age of Bacteriology" prior to 1900 the contribution that food can make to health was scarcely realized even for individuals, let alone for the groups of people that are the interest of public health. Medical interest

in which foods to prescribe or to forbid for specific disease conditions was largely without research guidance. The public health interest was in the sanitary aspects of food. Only a few people seem to have realized that the food itself is important for individuals and hence of concern to nations (4).

The first 3 decades of this century saw an astonishing development of a science of nutrition, including the discovery and pursuit of vitamins that seems to have reached a peak just before World War II. There was little application of such nutritional research in public health thinking or practices. In fact much of the time was taken up with useless arguments about vegetarianism, "fletcherism," graham flour, and the like. These arguments were of little value, just as many later ones in nutrition have been, because they distracted attention from the significant facts that were slowly accumulating. Indeed, such arguments may slow down much needed research.

The Hungry Thirties

It took the depression years, 1930-1936, to place nutrition firmly in the laps of governmental authorities, especially public health and welfare officers. In Canada at least, this was the time that the word "nutrition" was first really heard in such circles. This period saw the first recognition of people called nutritionists.

Publications from the League of Nations (34) and the International Labor Office (58) boldly called attention to the need for social and national policies adapted to helping individuals in their effort to maintain health. In those days health could be understood in the simplest terms of real or developing starvation in almost any area of the world. Governments discovered again that a hungry crowd is an ugly one. Great pioneers like Orr (37) could relate actual observations of the relationship of food to health, income and social stability. In these rather grim circumstances nutrition entered public health work — to feed unemployed, to assist industrial employees, to decide relief allowances.

There was very little application of the current nutritional research in these activities and discussions. Nutrition was too frequently discussed on the elementary level of enough food to fill, or to keep people alive, in spite of the intensive research on vitamins that was going on, and the discoveries in that field (16). Of course there were some people who realized that if the current research meant anything at all it meant the need for considering quality of food as well as its quantity.
But their ideas did not reach publication very often, even though they often influenced food distribution.

The Vitamin Phase

Vitamin research in the thirties was too spectacular and widespread to remain in obscurity. The vitamin phase in public health saw the beginning of expansive and rash promises by experts and the use of undefined health at a super level, "buoyant", "optimum", etc.

Nutritional research during the thirties continued to pursue those elusive food factors (the vitamins) whose presence in very small quantities protects people from specified deficiency diseases. There was a relative or complete neglect of the unsolved problems in other fundamental aspects of nutrition such as calories, protein, fats, and minerals. Actual count of the papers on vitamins contrasted with other nutritional questions seems to reach a peak ratio higher than 100 to 1 in the period 1936 - 1939 or just before World War II.

McCarrison (35) was constrained to say in 1939: "Biochemical and other facts accumulate with such rapidity, cover so wide a field, and their mass has become so great, that for some amongst us it may be difficult to see the wood for the trees." Yet attempts were being made to relate nutrition and national health.

In Canada, numerous writings by McHenry served to bring nutrition more into public health work (25, 26, 27).

This was also a phase of promises by "nutrition experts", of a new world not just free of hunger and free of deficiency diseases, but actually enjoying something special in the way of health — positive or buoyant or optimum (24). Even though a sober questioning is now given these ideas (46, 3, 5) it is easy to understand the enthusiasm of the time in the face of discovery after discovery in the vitamin field. It is almost understandable that when the war did start, field trials of army rations (45) had to re-discover the importance of calories or enough food, even as the proteins were to be re-discovered slightly later. And both calories and proteins were re-discovered in terms of simple foodstuffs rather than special mixtures.

Public health nutrition in this period was not just launched, it was projected, into a rash scramble of public information (and misinformation) together with some research in the form of dietary surveys, etc.

In this vitamin phase, and in the early part of the war period that followed there was another important effect of current nutritional research on public health programs — the idea developed that this optimum nutrition or optimum health could be achieved by government action, by public health or mass methods, rather than by slower educational measures. In fact public health tended to take nutrition away from the schools. Such an idea forgets

that "each individual must learn for himself what foods are needed for good nutrition and must improve his own nutrition by eating the foods he needs." (48). Actually both school and health units have a place along with better action by medical practitioners, if people generally are to be better nourished.

It was this vitamin phase of nutritional research which ultimately gave rise to the addition of vitamins and minerals to staple or commonly-used foods (32, 8). This public health measure brings specified nutrients to people who might need them, as well as to people who presumably do not need them. Just as masses of people can be given diphtheria toxoid to prevent diphtheria in some of them, so the public can be given extra quantities of vitamins that might otherwise become critically deficient in the diets of only some of them. From the classical public health viewpoint there is this fundamental difference in the analogy, that a person stricken with diphtheria in an unprotected community is a menace to everyone else, whereas a dietary deficiency affects only the one individual, at least in the short run. Both procedures suffer from some uncertainties as to their effectiveness. It may be noted that immunology is mature enough to have research still going on with regard to forms and dosages of toxoids, antitoxins, etc. while nutrition research on similar mass public health procedures is not common at present.

It is of course to be expected that the food industry, seeing these many developments in the science of nutrition, will desire to apply them wherever possible. Out of such work was developed enriched flour in the United States, and similar measures that have been described as "improvements of the food environment of the people." (see Borden's Review of Nutrition Research, Vol. 13, p. 83). To the extent that such commercial practices are based on facts concerning human nutrition and "considered reason" they have merit; any other basis serves primarily a commercial advantage.

The vitamin phase may be summarized by the following references to "optimum" health and to sickness other than deficiency disease (24, 48), conditions which are even today undefined and in my opinion not even clearly substantiated.

"If the knowledge acquired during the past quarter of a century is to yield its fullest fruit in the betterment of the national health, it must be recognized that an optimum supply of all vitamins, in an otherwise well-balanced diet is a prerequisite of optimum health; and that a minimum supply, while it may suffice for the prevention of certain specific diseases, creates the conditions precedent to the occurrence of a wide range of other sickness" (24).

The War Period

The war period intensified mass informational efforts, and brought to public health such research as nutrition surveys. The intense efforts of all kinds that went into World War II had a great effect in establishing nutrition in public health work at local, state, national and international levels. For the first time people and funds were available to health departments and others, both for research and applied nutrition.

Efforts to tell the public what to eat were greatly expanded. Nutrition caught the public fancy as a possible panacea for all ills. Never before was the public, at least on the North American continent, bombarded with so much information on foods and nutrition. For the most part, this information was thrown at the public to the despair of psychologists and sociologists on the one hand who wanted it more effectively handled, and on the other hand to the despair of medical and other scientists who found and still find some statements far beyond the proof they desire. Many of those giving this information (often incorrectly labeled education) lacked proper scientific perspective and caution.

Some research was started on food habits and how to influence them (33) but it languished for several reasons, in part the difficulty of formulating and executing good research projects in this area, and in part by the easier and more attractive "out" represented by the reliance on the simple conviction that all you had to do was to tell the people the facts and they would apply them. People experienced in public health educational work are aware that the opposition to the application of newly acquired knowledge can often be both vigorous and irrational. Only now, in the current period do we see much-needed research on educational procedures being actively prosecuted in a way that should benefit public health nutrition (21).

The war period gave rise to surveys of many kinds — dietary, nutritional, economic consumption and other surveys, often carried out by people who seemed to have little or no idea of scientific method or statistical design. These surveys, however, all had one great value that is often overlooked — they created or extended interest in nutrition among the surveyed population which was frequently manifest years later (41).

Dietary Surveys

It is worth considering the research aspects of these food studies in slightly more detail since they played and are still playing a considerable role in public health nutrition programs. Much work during the war period and since has sought to find out what a given group of people eat and how

to find it out most easily and accurately. In essence it seems simple to get people to write down what they eat each day, or to have enumerators make the record for children or other persons. But all experienced social workers and others who must interview people know that the person being interviewed is not likely to tell anything that may seem to reflect on him: he tries if at all possible to give the interviewer what he thinks he wants. When it comes to questions about foods, to cite but one example, the use of "prestige" items like steak stands in some relation to income, and therefore questions about them may be considered as reflecting on income. (We shall ignore here those attempts to get people to remember what they ate some time before — in one paper 10 years before!)

One basic question in such research is this; How many days must the record cover? There is no final answer. Some people, such as in Canada, continue to obtain 7-day records (10). But it has been shown (15) that records for any 3 weekdays give similar results to the 7-day record. Even a 3-day record takes a lot of effort so a 24-hour or diet history type of interview has also been extensively used.

This, like many other procedures was used blindly during the war period and the survey period, and only recently (60) has been investigated for validity. This study showed that when a group was being investigated, a diet record for one day was sufficient to give a picture of the average intake of the group. The day chosen did not seem to affect the results in some groups but was important in others. As for an individual, the number of days required to arrive at the average nutrient intake was more difficult to determine and depended on the degree of accuracy desired.

Untold hours have been spent calculating such records in terms of nutrients when any student of statistics could demonstrate that the estimated sizes of servings could have been ½ or twice the figure chosen (10). Yet these calculations were used to guide many public health programs, and even to "diagnose" people as malnourished. Fortunately the Survey Period, 1945-50, has now given way to a more careful look at such efforts and procedures. Some people have even reacted so extremely as to say that food records have no meaning and cannot be interpreted. As will be seen below, the same questioning attitude is leading to similar conclusions regarding medical and biochemical methods of assessing nutritional status.

As a means of creating interest in an area, and as a means of producing figures, however doubtful their validity, to impress the populace and the administrators, dietary surveys have had a tremendous value and influence on nutrition programs during the last 10 years. It is probable that they

have also done some harm, "oversold" nutrition, misled nutritionists as to the significance of dietary standards (56) and caused other errors that are slowly being corrected.

Nutrition Surveys

A nutrition survey, as we understand it in Canada (39, 40, 42, 43, 44) must include a food record (7 days), a clinical inspection, and as many physical and biochemical tests as may be carried out under the circumstances. In a given area the people tested have been selected in a random manner: On one island every 6th house was approached and nearly perfect cooperation received; the school children of one whole province were sampled by randomly choosing schools to a total of nearly 10% of all school children; in one urban community random-choice houses in each of random-choice blocks were visited. But for the country as a whole no true estimate of malnutrition can yet be given because the studied areas have been too diverse.

Many excellent reviews have appeared on methods of clinical or biochemical appraisal of nutrition (50, 12, 51, 59, 23). Unfortunately most of the ideas and methods evolved in the relatively uncritical vitamin and war periods were carried over and used in the survey period of 1945-50. Just as with dietary studies, these nutrition surveys had considerable effect on public health programs (1, 2, 55) even at the moment that their very basis was being questioned by more careful, critical research.

Doubts About Claims and Methods

The following item shows that doubts about claims for nutrition in public health were held as early as 1943: (7)

"The truth is that we do not know enough to decide how important a factor food is in national health. Such evidence as I have explored indicates that considerably more sickness and all-around human ineffectiveness is associated with malnutrition than was recognized a few decades ago. Essentially this is what the developments in the science of nutrition have taught us. But the recent proponents of health and nutrition may be somewhat over-zealous."

In the nutrition survey period, 1945-50, there was a new striving to reconcile educational efforts advocating the use of more of certain foods with actual health of people. It was often stated that people needed to eat more of this or that, yet the people in question showed no evidence of malnutrition. There was, and still is, a need to demonstrate that eating "more

of this or that" food actually produces measurable benefits, so as to sort out the more valid of these common empirical food recommendations.

Yet the methods of measuring such benefits are also uncertain. "These observations underscore an uncertainty in the clinical evaluation of nutrition" (3). "Studies of the state of nutrition imply the assessment of deviations from an ideal state which has not been defined" (5). Even the existence of that undefined condition called health or optimum health or buoyant health was now questioned (46):

"Preoccupation with sick persons has generally detached the mind of the physician from those investigations of ostensibly healthy populations upon which alone a better understanding of normal variability can be based. Without this better understanding diagnostic precision and therapeutic judgment must be hampered.

"Health and disease know no sharp boundary. But variability, both in time and in the species, is one of the most distinctive and necessary attributes of life, which thus admits no constant and no norm."

Other critics have pointed out that presence or absence of various tissue changes may not be important to a person's efficiency at the time (13, 14). For example, rickets may leave permanent changes that can be found in adults, but do not in any known way affect their health. Against this kind of criticism, of course, nutritionists can point out the obvious desirability of including the prevention of such abnormal tissue changes where possible through the use of appropriate dietary factors as one of the objectives in their public health work. Economists have stressed the "law of diminishing returns" to suggest that even if all these signs could be prevented it might cost too much for the doubtful benefit obtained.

Both in educational methods (38) and in medical nutrition (29, 30, 57) there were occasional relatively isolated indications that problems needed to be studied more deeply before the desired progress could be made in applying nutrition in public health. The collection of figures in, for example, hemoglobin surveys, without any indication of associated conditions or etiology was properly criticized (57) and the statements made:

"If we believe, as we have said time and time again, that a greater knowledge of nutrition can make a contribution to health, longevity and happiness, let us . . . begin to study specific problems on a large scale."

"Unfortunately, a large part of nutrition research done on groups of individuals has been directed at supposed evaluation of nutritional status without any attempt to study or demonstrate the effect of therapeutic testing."

The waning vitamin survey method, with its "special signs" of unknown etiology and significance in health or disease was losing its hold on public health programs, so that authors of a study on school meals referred in 1951 (53, 54) to signs "considered by some, but a greatly decreasing number of investigators, as pathognomonic of dietary deficiencies."

Current Trends, 1950—1953

In recent years there has been a re-discovery of the importance of thorough clinical study of specific problems in nutrition, rather than trying to cover all of nutrition in one vague program. Obesity, anemia, atherosclerosis, geriatrics are each receiving more direct and specfic attention, not just as nutrition problems, but in relation to total public health. Educational research is also returning to a less bombastic and more cautious experimental study of psychological fundamentals and sociological resistance (21). It is now realized that many people can eat a "good" diet, but show evidence of poor nutrition, due to many associated diseases or malfunctions (39). These are cases of secondary or conditioned malnutrition, which require individual evaluation by physicians, rather than mass approaches of public health. Other cases of "poor" diets without evidence of poor health of any kind emphasize the adaptability of the human organism and the fallacy of "assessing" nutrition by merely considering lists of foods rather than looking at the person.

Some deep-going studies on specific problems are being carried out (19, 47, 6, 22, 40). But such studies are costly in time and money, and are less spectacular both for the public and for administrators. Therefore, they are not carried out nearly as often as needed to provide the sound foundation that will carry nutrition to its proper place in public health. In fact this is a return to the epidemiological approach that has served well in other fields (9, 18). It involves a return to the scientific method of hypothesis, designed testing and retesting, which alone can overcome the undesirable effects of earlier enthusiasms.

In the educational field nutrition is becoming more firmly established in school courses, and increasing attention is being given to teacher training, physician training, etc., as well as more carefully considered adult education.

Summary

A relationship between nutrition research and public health programs has been traced along the following lines: Public health nutrition really began in the Hungry Thirties, when people called nutritionists began em-

phasizing the quality of food as well as its quantity in special reference to relief diets. This emphasis resulted from the spectacular work on vitamins of that time and led into the Vitamin Period in public health work, characterized too often by attempts at mass approaches and extravagant promises. The War Period intensified the educational efforts and gave rise to research in and with the public health nutrition program, especially in the form of dietary and nutrition surveys. The Survey Period following the war saw a disillusionment, as survey results went unused or were even unusable, when food records could not be correlated with clinical findings, when mass educational efforts brought few apparent returns and when medical arguments over the real meaning of health and nutrition became more frequent. A return to research is evident both on education and on the origin and significance of specific problems in nutrition, which puts the subject on a more individual basis. Such research is so costly in time and money that it is best done as part of, or in association with, public health nutrition programs, so that experience on both sides may help to reach useful conclusions for specific problems, rather than the wasteful over-enthusiastic efforts of the past. Such specific problems include anemia, obesity, cirrhosis, atherosclerosis and many others in which nutrition has a role that may become part of public health.

An attempt has also been made to define public health nutrition in a manner that includes all aspects of well-rounded programs of the present time.

FORECAST

The protein molecule might well be the apex upon which all life rests — it is the pre-eminent biological substance. The need for protein, or more appropriately the amino acid building blocks, has been the subject of extensive research in Biochemistry and Nutrition. Only in very recent years have we learned something of the amino acid requirements of man. In a forthcoming issue of *Borden's Review of Nutrition Research* the subject, The Amino Acid Requirements of Man will be discussed in light of nutrition research with both animals and man.

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ABOUT THE AUTHOR

DR. L. B. PETT may well speak with authority on the problem of Nutrition Research In Public Health, in view of his accomplishments in fundamental biochemical and nutrition research and his broad experience in the Nutrition Division of the Canadian Department of National Health and the Canadian Nutrition Council. *Borden's Review of Nutrition Research* welcomes our northern neighbor to its list of authors.

Dr. Pett, a native Canadian, was born in Winnipeg, Manitoba, in 1909. He received his undergraduate training at Toronto where he obtained the B.Sc.A. degree in 1930. He remained a fellow at that institution for several years, receiving the M.A. degree in 1932 and the Ph.D. degree in biochemistry in 1934. His medical training was taken at Alberta, while also serving as a lecturer in biochemistry. He was awarded the M.D. degree in 1942. Prior to his entrance in Medical School, Dr. Pett had the opportunity of a scholarship for post graduate study in Stockholm and Cambridge. This broad educational background has been and is being focused on the sound study of nutritional problems in Canada and elsewhere as the results might be applied.

Printed in U.S.A.